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SOUTHERN FOREST RANGES

FROM

THE WESTERN RANGE—A GREAT
BUT NEGLECTED NATURAL RESOURCE

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

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APPENDIX

SOUTHERN FOREST RANGES

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Conditions on ranges in the Southern States differ markedly from those found in the West. The South is not usually thought of as an important factor in the livestock industry of the country. However, southern forest-range lands cover an immense territory. Within this wide region there are, roughly, 300 million acres of land, two-thirds of which is in forest of one form or another. Most of this 200 million acres of forest land provides some grazing for livestock. Nearly all of the livestock owned by farmers is handled in small herds and for the most part is allowed to range at large. The industry contributes an important share of the income and subsistence of southern farmers.

The South, as covered in this report, includes the nine States from Virginia to Louisiana and Arkansas and the pine-forested sections of eastern Texas and eastern Oklahoma, as shown in figure 86. It can be divided roughly into four physiographic divisions: (1) The extensive Coastal Plain; (2) the Piedmont; (3) the Mississippi River bottomlands; and (4) the remaining area, including the Appalachian-Ozark highlands, sand hills, silt-loam uplands, prairies, marshes, etc. The Coastal Plain and Piedmont form the major part of the southern forest-range land. On these the predominating soils are sands and sandy loams, overlying more or less impervious clay subsoils.

The climate provides mild winters, hot summers, rainfall usually abundant throughout the year, and long growing seasons. Such a climate is conducive to rapid growth of vegetation.

According to the 1934 agricultural census, the area of crop land on southern farms totaled approximately 64 million acres; pasture land amounted to 44 million acres, divided into plowable, 12 million acres; woodland, 24 million acres; and other, 8 million acres. The forest land under fence and devoted to permanent improved pastures is relatively small—probably not over 20 million acres; the remaining 180 million acres of other forest land is also open forest range.

The early settlers in the South appreciated its possibility as a stock-raising country and the forest ranges have been used to some degree for livestock since the early colonial days. While only a small proportion of the total livestock values in the United States are in the South, the number of packing plants, creameries, and cheese factories there is gradually increasing, and the region may some day become self-sufficient in the production of livestock and livestock products.

Table 89 gives the latest data available (1935) on the number and value of livestock in the South in comparison with the United States as a whole.

TABLE 89.—*Number and value of Nation's livestock on farm and range in the South, as of Jan. 1, 1935*¹

Type of stock	Proportion of Na- tion's livestock		Value in relation to total value for Nation	
	Thousands	Percent	Thousand dollars	Percent
Horses and colts.....	754	6.5	55,064	6
Mules and mule colts.....	2,171	45	238,646	52
Cattle.....	7,423	12	111,135	9
Sheep and lambs.....	976	2	3,506	1.5
Hogs and pigs.....	6,792	18	35,564	15

¹ Bureau of Agricultural Economics estimates.

These data indicate a total of 18,116,000 head of livestock on open and fenced ranges in the South. This represents 14 percent of the total number and 11 percent of the value for the United States as a whole. That the proportionate value of southern livestock is less than their proportionate number, with the exception of mules, is indicative of the lower quality of animals produced in this section of the United States.

FORAGE, FEED, AND RANGE RESOURCES

The principal southern forest range is in the longleaf-slash pine type extending through the lower South, near the seaboard (see map). It consists of large openings in the heavily cut virgin timber stands and typically open grass-covered areas in much of the second-growth forest and embraces altogether about 55 million acres.

The next most important type coincides with the extensive loblolly-shortleaf-hardwood forest of the upper Coastal Plain and Piedmont region, covering approximately 80 million acres of forest land. This forest is usually denser than the longleaf-slash forest and has less forage available.

Other southern forest types that contribute to open range grazing include the bottomland hardwoods (30 million acres) and the upland hardwood forests (35 million acres). The hardwood bottomlands in the Mississippi and other river valleys are more heavily forested than the pine country and support little grass but considerable browse. Switch cane stands, formerly quite abundant here, afford excellent winter feed, but have been greatly reduced by overgrazing and fire. "Paille finne" grass in the bottom lands of the Delta is used for summer grazing and is attracting attention because of its high forage value. It occurs most abundantly on lands where the water level is within 2 or 3 feet of the surface. If cut early and while it is still succulent, it makes good hay. Unfortunately the wild variety bears little seed and artificial propagation by vegetative methods is slow and expensive. The upland hardwood types of forest are not heavily stocked, but provide part-time grazing.

The native herbage of the South consists largely of such grasses as the beardgrasses, or "broomsedges" and the three-awns, or "wire-

grasses", augmented with a scattering of switch canes and other broad-bladed grasses and swamp plants. The grazing capacity of such forage during the grazing season (March–October) varies from 5 to 25 acres per animal unit, with the commonly accepted average of 10 acres. The palatability of the native grasses is, in general, rather low, although during the spring excellent grazing is available for a period of about 90 days. The warm, moist climate brings about a rank growth and early maturity of these grasses. The pro-

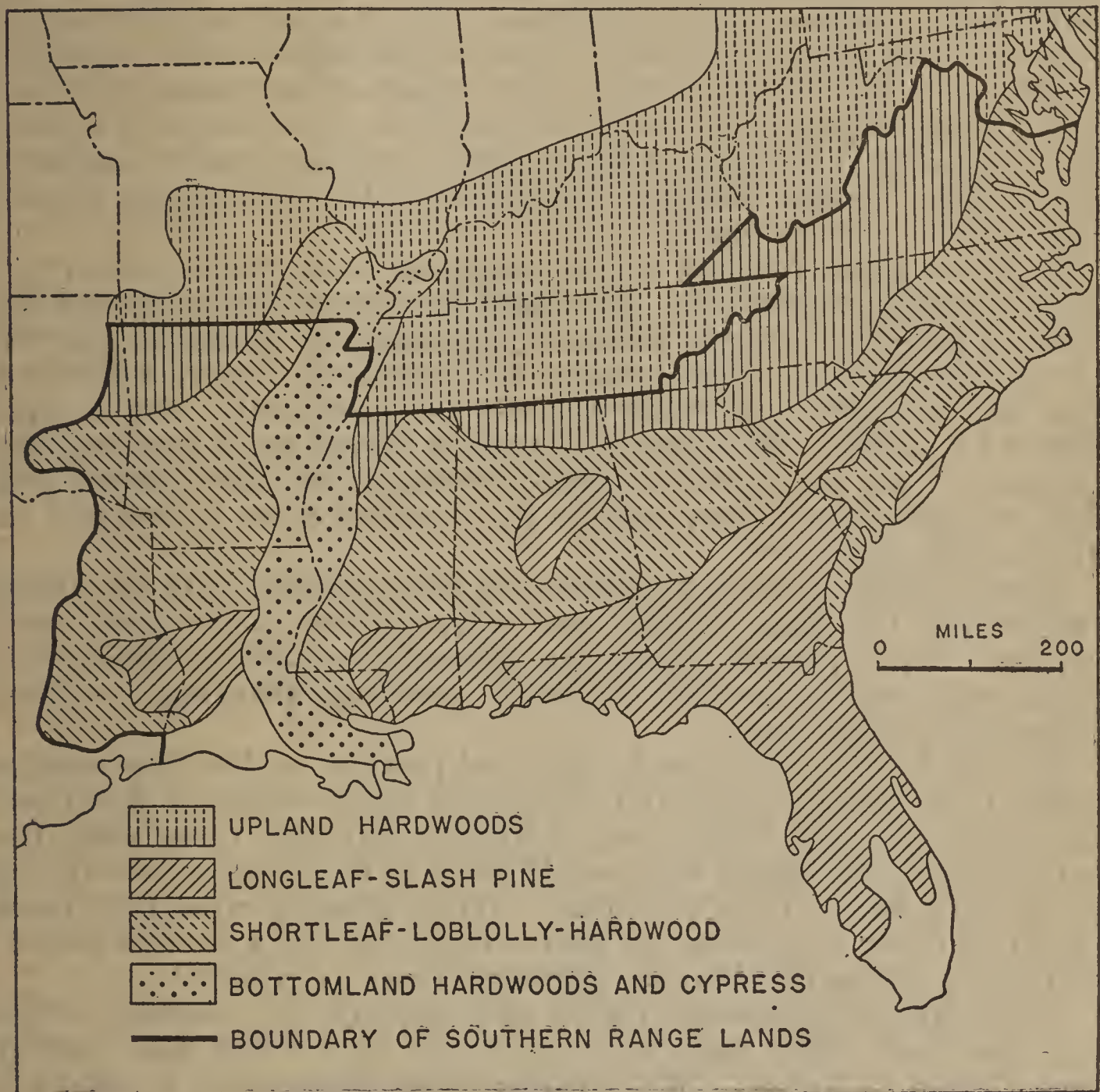


FIGURE 86.—SOUTHERN FOREST RANGES.

Approximately 200 million acres of southern forest range is grazed by domestic livestock which contribute an important share of the income and subsistence of southern farmers.

tein content and hence the nutritive value drops rapidly as maturity approaches, and cattle will not thrive long on this forage alone. The livestock owners customarily burn off every winter the "rough", as this accumulation of dead grasses is locally known, in order that fresh feed may be more easily available to livestock in the spring. This widespread burning is practiced as a rule without regard for the possibility of damage to the forest. Where successive burnings are made at intervals throughout the winter the animals will move progressively over the area, and the period of easily available forage

is thus lengthened. Bottomland plants and broad-leaved grasses supply important winter feed for cattle and deer. Excessive or unregulated burning can jeopardize this food supply.

In addition to native grasses a number of species of grass and legumes which have been introduced and become naturalized in the South have proved to be of high forage value. The most notable are Bermuda, carpet, and Johnson grasses. Bermuda grass is found mainly along roadsides and ditches and in abandoned fields. Carpet grass, which maintains itself in competition with native grasses only under heavy grazing, will stand closer cropping and heavier trampling than any other local grass. It is so palatable that it is nearly always very closely grazed and left unburned by common woods fires. Johnson grass is a notorious invader of cotton fields. The carrying capacity of all three of these grasses is much greater than that of the native species, but their occurrence on the forest range is still very limited and localized.

Improved pastures cover only a small area in the South, but are of great potential importance. The most promising forage plants for summer pasturage are the common lespedeza and Bermuda, carpet, and Dallis grasses. These plants are extremely hardy, withstand heat and drought, and renew themselves vegetatively with a high degree of success. If intensively grazed carpet-grass pastures are allowed to rest, the nutritive value is retained into late summer and fall; if desired for winter pasture the livestock must be removed in July and August.

In the Piedmont, winter pastures can be established with the use of sweetclover, Carolina, crimson, and white clovers, black medic, and vetches. These pasture plants are, however, subject to climatic injuries and require frequent artificial reseeding, planting, or other cultural encouragement.

The chief limitation of such improved pastures is that they require better than average soils and occasional applications of fertilizer. Improved pastures have a much higher nutritive value than the native range, supporting one head of cattle to each acre or two during the grazing season (6 to 9 months). Their grazing capacity is more than five times as great as on native range during a similar period, and the rate of gain in live weight often twice as rapid.

In the upland hardwood region such pastures are confined to the rich cove and valley lands and fertile hill land which has recently been cleared of forests. Well-drained moist areas along streams are the best locations in the Piedmont, while the Coastal Plain region produces its best pastures on low, well-drained soil. In the latter region excellent growth of inkberry or "gallberry" is considered as a good indicator of desirable land for permanent pastures.

After removal of the primary agricultural crop, fenced fields, especially if cultivated, may be used temporarily as pastures. These pastures usually contain a mixture of legumes, weeds, and remains of crop plants such as corn, sugar or ribbon cane, and sorghum, valuable alike to wildlife and domestic animals.

Feeds for winter use can be put up at a very reasonable cost. The production of hay is more difficult in this prevailing moist climate than in the drier regions to the north and west, although the yields per acre compare favorably with those regions. Cowpeas, lespedeza,

and grasses constitute the principal hays. With the invention of the trench silo, the use of sugarcane and sorghum as silage has become more general. Dairy cattle are also fed cottonseed meal, corn, and home-grown or imported grain feeds.

CHARACTER OF DOMESTIC ANIMALS

Nature has developed in the South such distinct varieties of livestock animals as piney-woods cattle, razorback hogs, and the southern mule. As a product of natural selection they survive and thrive better in their southern environment than do the animals of artificial selection and breeding introduced from outside the region.

The first southern cattle were largely of Spanish and English origin, known as black cattle. These animals were small and poorly shaped, but extremely hardy and highly resistant to disease and parasites. Many attempts to raise and breed pure unacclimated stock from other regions have failed because of the cattle fever tick, ignorance of local conditions, or overcapitalization. Certain breeds, chiefly Aberdeen Angus, Hereford, and Shorthorn, have been introduced into the South and gradually absorbed into the basic stock. The first and second crosses of native cattle with improved breeds of stock have been found better suited to southern needs than either of the parent stocks.

The present typical pine-woods cattle are light and the weight too far forward to produce the most valuable meat cuts of high-quality beef. Such deficiencies date from early days and have arisen largely from a tendency to "top" herds by disposing of the best animals and from excessive inbreeding. At present only a small percent of the blooded cattle of the country are found in the South, but the advisability of gradually breeding up local stocks, using local piney-woods cows as the foundation of the herd, is well established. The production of calves for veal to be consumed locally also offers possibilities. The dairy industry is a present-day development in the South. It utilizes largely mixed native and Jersey cattle.

Sheep, raised primarily for wool, are also of Spanish origin. The production of mutton has been almost unknown and only recently has the possibility of raising lambs for market been considered. That the southern environment is far from ideal for sheep is reflected in the high susceptibility of these animals to organic and parasitic disease, particularly where crowding occurs, and in lightness of fleece. In the South the fleece averages less than 5 pounds in weight, while the average for western sheep is more than 8 pounds. It is estimated that, between 1933 and 1935, screwworms caused a loss of as much as 20 percent of the sheep in portions of the Southeast.

Unlike sheep, hogs have been especially successful in acclimating themselves in the Southern States. Farm hogs benefit from inoculation against cholera and respond well under close management. Essentially a forest animal, the hog has been at home in the pine and oak forests from the very beginning, feeding upon acorns, seeds, grubs, and the succulent roots of pine trees. "The excavating abilities of the pine rooter, a long-nosed beast called 'razorback', are an athletic marvel excelled only by his speed (132)." The hogs are

prolific and require practically no attention by the owner except salting or occasional feeding to prevent their wandering too far afield.

In the South, the horse has been developed principally for the saddle or as a light draft animal, while mules have taken the brunt of the heavy farm work. The best mules are produced in the northern part of the region; many are brought in. It is doubtful whether any other animal has been developed which can stand up under the warm climate, disease, and hard work as well as the southern mule.

WILDLIFE ON SOUTHERN RANGES

A discussion of grazing on forest ranges would not be complete if confined entirely to domestic stock; wildlife is also a user of the open range. The principle game birds are quail, doves, and turkey; game animals, deer and fox; and the fur bearers include opossum, raccoon, skunk, otter, fox, wildcat, squirrel, and rabbit.⁴⁹ To the traditional and widely recognized sentimental and recreational values of wildlife, a variety of commercial values are now being added at many points. The market values of fur and hide are well known, of course. Certain typical cut-over pine lands in the South have been leased for quail-shooting privileges for as much as 15 cents per acre per year. At a value to the user of 30 cents a pound, the dressed carcass of a deer is worth more than that of a native cow raised on the same area. Though not susceptible of precise measurement, the economic value of birds in retarding epidemics of insects is very real.

The greater portion of the forest land in the South is still open to the public for hunting, fishing, and trapping, but private gun clubs and shooting grounds are becoming increasingly popular, along with a demand for more game preserves. Before the white man came extensive areas of the southern "pine barrens" were too uniform, open, and limited in food and hiding places to produce any great amount of wildlife. After the territory was settled increased natural propagation of wildlife resulted indirectly from the numerous widely scattered cleared fields and roadsides where the development of dense patches of hardwoods, bushes, and grass add to the supply of both food and shelter. Many of these trees, shrubs, and plants have previously been regarded as mere weed species. Birds consume many small fruits and seeds found in old fields and in forest openings, especially during periods when insects are not available. As the same openings provide abundant browse and forage for deer, they have multiplied, but in general settlement of the country decreased the supply of the larger animals, while it often increased the numbers of birds and small game.

The possibility of conservation through plan-wise use of wildlife is receiving increased recognition in the South. Investigations, par-

⁴⁹ No census of game has been made for the South as a whole. The following data are indicative, however, of the numbers and values of wildlife in southern forests. The kill in Alabama for the season of 1929-30, as reported by the Department of Game and Fish, was: 2,400,000 quail, valued at \$1,200,000; 800 deer, at \$20,000; 1,000,000 doves, at \$250,000; 615,000 fur bearers, at \$2,000,000; and 3,000 turkey, at \$30,000. The kill in Texas during the season of 1932-33 was 6,104 deer, 2,182 turkey, and 1,407,884 fur bearers, as given in the Annual Report of the Game, Fish, and Oyster Commission for the fiscal year 1932-33.

ticularly on quail in Georgia, have shown that much can be done to augment game supplies simply through inexpensive measures to bring about favorable changes in natural environment. Much consideration must be given to the most practical means of integrating conflicting interests where the same land is being used for the production of domestic livestock, wildlife, and trees of commercial value. Undoubtedly domestic animals will have to be excluded from areas under intensive management for game, nor can much wildlife be expected to frequent areas intensively used by domestic livestock. Although not affecting game directly, domestic animals are recognized as having an unfavorable influence on many factors which control game animals, such as food supply, disease, parasites, and coverts. The degree of encroachment, however, is proportionate to the numbers of stock, so that in nonintensive range use as in the publicly owned forests, the conflict in requirements of wild and domestic animals is minimized. A practical balance may be attained on superimposed or overlapping ranges, although a more stable and satisfactory cohabitation can be developed where it is possible to segregate the grazing and wildlife projects on more or less separate portions of the managed areas.

Where they are available, the seeds of legumes form a large part of the natural food for quail. Valuable native legumes are increased by a moderate amount of controlled burning which, when properly handled, has been found beneficial to both quail and cattle ranges and is sometimes compatible with timber production. The new spring grass for cattle and subsequently the seeds for the birds are both more readily available on winter-burned areas, whereas summer grazing on native grass is not only unsatisfactory for domestic animals but destructive to quail feed, consisting largely of leguminous seeds.

Where such an increase in game as quail, turkey, and deer is desired, land management should be modified to meet the requirements of game. The following measures are recognized as of outstanding importance in increasing the game populations in the South: (1) Control (or exclusion) of grazing by domestic animals; (2) provision of an adequate food supply, mainly by making openings in the forest, or, under certain conditions, by the controlled use of fire; (3) if necessary, the restocking of favorable habitats by planting imported game species from similar and not too distant places; (4) protection through proper and effective control of hunting and trapping; and (5) the improvement of the environment for wildlife by cultural measures, such as the provision of nesting and hiding places (refuge cover) and the control of predators.

UNDESIRABLE CONDITIONS AND RANGE PRACTICES

At least 95 percent of the forest land in the South is privately owned, and much of it is in the hands of large owners who have apparently not shown much or any interest in livestock production. In accordance with age-old custom, southern landowners usually tolerate grazing on their forest lands by the livestock of numerous small farmers. The typical forest range is open, no permits are required, no fees are charged, and often no attempt is made to control

fires set by stock owners to benefit the forage. The ability to survive despite lack of care or cost has allowed the stigma of cheapness to become attached to the southern livestock industry. "This type of farmer expects his stock to cost him nothing and is not disappointed if they yield him little" (167). Laws designed to force stock owners to keep animals under fence have been adopted in certain localities, but have not been generally enforced where agricultural crops are of minor value, as is the case in many areas where forest use predominates. It has been regarded as more economical in such cases to fence in the crop land instead of the ranges, thus foregoing the advantages to be had from better control of livestock on the range.

In spite of progressive work by the State agricultural experiment stations and extension services, no widespread interest has been shown in the adoption of improved methods of animal husbandry. Attempts at improvement of the animals through selection and breeding have been sporadic and inconsistently followed. Lack of organization and progressive leadership within the industry to obtain such benefits is a handicap. Enclosed and improved pastures are few in the South. All too often hopeful livestock projects have failed because they were primarily promotion schemes subordinated to some attempted land boom or desperate effort to sell depleted forest lands.

Limited areas of improved pasturage have been created by sodding road shoulders with Bermuda grass, but livestock interests are thus benefited only at the expense of traffic accidents along highways. Ultimately, as the country develops, something must be done to remove rather than aggravate this public hazard.

ECONOMIC TRENDS AFFECTING GRAZING

From the time of the early settlements until the war between the States, and excepting for the periodic business depressions suffered over the entire country, the South enjoyed an almost continuous period of rural expansion and a reasonable degree of prosperity. Primary products have ranged from tobacco, indigo, and cattle, to cotton and timber. The resources, land and wealth, were in the early days largely controlled by a few, while the work was done either by slaves or by the lowest class of white laborers. Exceptions were those people who settled the less productive areas, such as high pine lands, easily eroded hillsides, or remote recesses of the high mountains.

In the production of hides and meat, the southern cattle industry was rather important in the latter half of the eighteenth century and early part of the nineteenth, but declined before the advance of the plantation system, which, based upon the one-crop (cotton) idea, held little place for livestock. More recently, the plantation system has partially broken down through the effects of the bollweevil, soil depletion, and world competition for cotton, and is shrinking back to the inner Coastal Plain and Delta on which it reached its highest development and where it may be maintained. This belt, producing cotton, tobacco, and corn, is deficient in meat and milk products, and this situation offers an opportunity for livestock expansion.

The South has vast areas where an expansion in livestock is possible and desirable. The Piedmont-Appalachian country is capable

of producing ample stocks of dairy products for southern markets, while the Coastal Plain offers opportunities for the production of beef and other meats. The opportunity and need for an expansion in livestock and milk production is being given recognition by the Agricultural Adjustment Administration. The following statements were made recently by two members of the Agricultural Adjustment Administration:

In the South, the chief recommendations (of the Agricultural Adjustment Administration) are for a decrease in cotton acreage and * * * for increases in total crop land, in pasture land, and in the production of all of the southern feed crops, except corn. These recommended changes are designed to lessen soil depletion and control soil erosion, and to furnish a more adequate feed base for livestock production in the South. As a result, considerable increases are recommended for all classes of livestock * * * (and milk production) * * * chiefly designed for farm consumption. That is, they would be used to improve the standard of living of farmers and farm workers in the South rather than for the commercial market.⁵⁰

Studies of human nutrition indicate that from a dietary standpoint, increases in consumption of dairy products and lean meat, and decreases in consumption of fat meats, are desirable. The shift toward more hay and pasture consumption by livestock, and less feed-grain consumption, would be in the right direction * * *.⁵¹

Freedom from land taxes and rentals on the range used but not owned and freedom from nearly all investment expenses have afforded a cash income and considerable profit to many southern livestock owners. The annual sale of livestock in the South often brings in the only cash income received during the year, and many bank accounts have been derived wholly from livestock. A great handicap has been and is the lack of the improved pastures that are essential to the most economical production of livestock. Furthermore, in some sections low soil fertility has made pasture development difficult. Pasturage is the cheapest possible form of feed. This is indicated by studies made in 1921 by the Pennsylvania Agricultural Experiment Station (183), showing the labor cost per ton of digestible feed to be \$21.21 for silage, \$15.94 for grain, and \$0.66 for pastures. The discovery of an all-purpose grass for the South, such as timothy in the Northeast, that will thrive and produce both hay and permanent pasture, would be a real boon. Nevertheless, unlike much of the livestock in the West, southern livestock can be fattened locally, avoiding shipment to other regions to prepare the animals for market. Although not general practice, it has been demonstrated at some of the southern State agricultural experiment stations that the use of suitable animals and feeds produces meat that compares favorably with western products at the local markets.

A few steps have been taken and definite progress has been made in improving conditions for southern cattle. Most outstanding has been the elimination of the cattle-fever tick from most of the region. The cattle-fever tick area in the United States has been cut down within the past 30 years to less than 9 percent of the area infested when the Department of Agriculture started to drive it out of the

⁵⁰ Wells, O. V. The Regional Adjustment Project: A Summary and Some Suggestions for Further Work. Address before the Association of Land Grant Colleges, at Washington, D. C., Nov. 20, 1935. U. S. Department of Agriculture, Agricultural Adjustment Administration (mimeographed).

⁵¹ Tolley, H. R. Regional Adjustment and Democratic Planning. Address before the Association of Land Grant Colleges, at Washington, D. C., Nov. 20, 1935. U. S. Department of Agriculture, Bureau of Agricultural Economics (mimeographed).

country. On July 1, 1906, when eradication work began, nearly 730,000 square miles in 15 States was under Federal quarantine because of the tick. On December 1, 1935, only a little more than 62,000 square miles remained under quarantine—in Florida, Louisiana, and Texas. This work has removed a discouraging obstacle to the wider use of improved strains in breeding stock, since pure-blooded animals have been particularly susceptible to this disease. Another worthwhile accomplishment has been the development of the dairy industry, particularly in the upper Coastal Plain region. On relatively limited local areas it has brought about the fencing and improvement of pasture lands for controlled and intensive use. An economical trench silo has been developed and superior forage and feed plants introduced in the region through the agricultural experiment stations. On the Coastal Plain in Florida a cooperative colonization scheme, after experiencing the failure of several agricultural crops on rather poor soils, appears now to have established a stable cattle-growing project.

PROGRESSIVE STEPS NEEDED

As a first requisite in the solution of the range problem, early action should be taken to extend the use of known improvements and to coordinate knowledge already acquired of improved management for livestock, wildlife, and forest products.

Further progress is needed in harmonizing conflicting interests in land use and thus increasing the control of landowners over the use of extensive areas of cut-over timber or range-land managed for such specific purposes as are economically justified. The right of owners to exclude or control range fires on such lands must not only be legally recognized, but also be generally respected, whether the land is to be devoted to the production of timber, livestock, or game animals. Often the various more or less conflicting uses can be advantageously combined. Land-use plans may be expected to provide for varied integrated use of some areas and single segregated use of other areas. Thus commercial grazing may be recognized on certain national forests and only subsistence grazing by local residents may be permitted on other national forests. Domestic livestock may be largely excluded from certain forests, public or private, where game refuges are desired or where grazing interferes with the reproduction of valuable hardwood forest trees. In the latter case it is essential to regulate the grazing, particularly during the stage when the forest area is being reproduced. Whatever the dominant purpose of management may be, adequate control of land use and occupancy is essential to the most successful management. This is particularly true of large areas in the South where such control has not been attained.

Extension of fencing is necessary to effect control of land, and with this extension the known methods of improving pastures, game preserves, and ranges will become more practical as owners will then be able to retain for themselves the benefit of investments in improvements. Similarly the improvement of livestock can then be carried forward more rapidly and consistently. From what is already known, the progress made so far by the livestock industry can be extended materially as soon as the landowner's right to full control is more widely respected. Such wider application of improved

practices will naturally be accompanied by further demands for information that can be obtained only from investigation and research.

A PROPOSED PROGRAM FOR RANGE RESEARCH

Research on southern forest-range problems calls for coordination in the fields of forestry, range management, animal husbandry, agronomy, and economics. The open-forest range should not be considered by itself, but in conjunction with the development of native and improved pastures.

In forestry the most urgent studies will deal with the following features:

(1) Controlled, periodic, and rotation burning for silvicultural or forest-protection purposes, as related to grazing: This is particularly important for the longleaf-slash pine ranges of the Coastal Plain.

(2) Other silvicultural problems dealing with the conflict of grazing and other forest uses: These problems are more prevalent in the central and northern portions of the region where hardwood species are valuable, and where tree seedlings and soils are particularly susceptible to injury from fires and overgrazing.

(3) Watershed protection: Where erosion results from overgrazing or from burning, the strict regulation or exclusion of grazing and burning is essential.

(4) Forest wildlife relationships: Forest lands are the principal home for wildlife in the South. Forest-land management, including use and control of fire, may have an important bearing on the maintenance of wildlife.

Range management research should cover the following fields:

(1) Determination of relative forage values, at the different seasons, of the important range plants.

(2) Methods of artificial reseeding and improving ranges.

(3) Grazing capacities of various types of ranges.

(4) Systems of range management.

Animal husbandry problems should include:

(1) Feeds and methods of winter feeding.

(2) The production of better livestock by selection and breeding.

(3) The proper care of animals, including such items as dehorning, castration, shelter, bedding, water, salt and mineral nutrients, and particularly the control of disease and parasites such as the screw worm.

Agronomy studies should include:

(1) Agronomic features of artificial reseeding and the development of satisfactory improved and cultivated pastures.

(2) Local production of forage for fall and winter use.

(3) Methods of culture of carpet grass for use on fire lines and old fields.

(4) Improvement of plants for range and pastures through breeding and selection.

In economics there is a need for:

(1) Land classification and surveys including a review of the present status of the livestock industry.

(2) Determination of production costs.

- (3) Range organization and management.
- (4) Group financing of improvements.
- (5) Cooperative marketing of products.
- (6) Part-time forest employment of small stock owners.
- (7) Manner and extent of harmonizing the economic aspects of forestry, wildlife, and range uses.

The value of starting such a program in the immediate future becomes more apparent when consideration is given to the social benefits to be expected.

SOCIAL AND ECONOMIC BENEFITS ATTAINABLE

The southern people can be expected to accept changes permitting a gradual rise in their standard of living. A forward-looking program for the development of the southern livestock industry on forest ranges supplemented by improved pastures would benefit the region socially, in the following ways: (1) It would increase the quantity and quality of local food supplies. Meats of better quality and dairy products for more of the people are needed throughout the South. (2) It would increase the cash income of farmers. Already the principal source of income from rural markets to many small owners of livestock, the quality of meat produced locally has yet to be developed to the point where it can reclaim the local urban markets, now dominated by the meat products of other regions. (3) By providing an annual return, landowners would be assisted in meeting the carrying charges for protecting and managing forests and farm woodland. The owners of small tracts of woodland, or the managers of larger forests that have been overcut, can ill afford to neglect this opportunity for additional income from livestock. (4) It would assist in stabilizing agriculture, by promoting the diversification of farm products. Over considerable areas the boll weevil has removed cotton as the money crop, leaving no single successor. Crops of timber and livestock may well take a prominent place in a more stable and diversified agriculture. (5) The improvement and development of the southern livestock industry may be expected to play an important role locally in maintaining communities that are threatened with disintegration as a result of the temporary depletion of timber or failure of cotton as their main source of support.

All of these benefits await the continued intelligent development of the livestock industry on forest ranges and pastures as adapted to local conditions, and as a part of progressive farm and forestry practice.

ADDITIONAL LITERATURE ON SOUTHERN FOREST RANGES

GENERAL

ENOCHS, F. B.

EXPERIENCES IN CATTLE RAISING ON CUT-OVER LANDS. Proc. Cut-over Land Conf. of the South, pp. 93-96. 1917.

FARLEY, F. W.

GROWTH OF THE BEEF-CATTLE INDUSTRY IN THE SOUTH. U. S. Dept. Agr. Year-book 1917: 327-340, illus. 1918.

——— and GREENE, S. W.

THE CUT-OVER PINE LANDS OF THE SOUTH FOR BEEF-CATTLE PRODUCTION. U. S. Dept. Agr. Bull. 827, 51 pp., illus. 1921.

FERRIS, E. B.

DAIRYING ON CUT-OVER PINE LANDS. Miss. Agr. Expt. Sta. Bull. 166, 24 pp., illus. 1913.

FOOTE, F. M.

UTILIZATION OF CUT-OVER LANDS FOR LIVE STOCK. W. Va. Dept. Agr. Bull. 30: 32-35. 1917.

GREENE, S. W.

THE STOCKMAN'S INTEREST IN PROTECTING FOREST AND RANGE FROM FIRE. South. Forestry Cong. Proc. 11: 52-59, illus. 1929.

HEYWARD, F., and BARNETTE, R. M.

EFFECT OF FREQUENT FIRES ON CHEMICAL COMPOSITION OF FOREST SOILS IN THE LONGLEAF PINE REGION. Fla. Agr. Expt. Sta. Bull. 265, 39 pp., illus. 1934.

HOLMES, J. S., and FOSTER, J. H.

CONDITION OF CUT-OVER LONGLEAF PINE LANDS IN MISSISSIPPI. U. S. Dept. Agr., Forest Serv. Circ. 149, 8 pp. 1908.

PESSIN, L. J.

TIMBER AND CATTLE CAN BE RAISED TOGETHER ON SOUTHERN CUT-OVER LAND. U. S. Dept. Agr. Yearbook 1930: 512-514, illus. 1930.

TEMPLETON, G. S.

BEEF CATTLE PRODUCTION IN MISSISSIPPI. Miss. Agr. Expt. Sta. Bull. 268, 31 pp., illus. 1929.

WAHLENBERG, W. G.

EFFECT OF FIRE AND GRAZING ON SOIL PROPERTIES AND NATURAL REPRODUCTION OF LONGLEAF PINE. Jour. Forestry 33: 331-338. 1935.

ECONOMICS

BURMEISTER, C. A., CONWAY, H. M., and BRODELL, A. P.

ECONOMIC FACTORS AFFECTING THE BEEF-CATTLE INDUSTRY OF VIRGINIA. U. S. Dept. Agr. Tech. Bull. 237, 66 pp., illus. 1931.

HOBBS, S. H.

NORTH CAROLINA, ECONOMIC AND SOCIAL. 403 pp., illus. University of North Carolina Press. 1930.

JENNINGS, R. D., and CROSBY, M. A.

AN ECONOMIC STUDY OF LIVESTOCK POSSIBILITIES IN THE SOUTHEASTERN COASTAL PLAIN. U. S. Dept. Agr. Tech. Bull. 127, 96 pp., illus. 1929.

NORTH CAROLINA STATE GEOLOGIST AND STATE FORESTER.

A STATE-WIDE STOCK LAW FOR NORTH CAROLINA. N. C. Geol. and Econ. Survey Press Bull. 97, 3 pp. 1912.

SHEALY, A. L.

BEEF PRODUCTION IN FLORIDA. Fla. Agr. Expt. Sta. Bull. 260, 54 pp., illus. 1933.

VINALL, H. N.

PASTURE IMPROVEMENT THE FIRST NEED IN STRENGTHENING SOUTH'S LIVESTOCK INDUSTRY. U. S. Dept. Agr. Yearbook 1931: 421-424, illus. 1931.

FORAGE

ALDOUS, A. E.

EFFECT OF BURNING ON KANSAS BLUESTEM PASTURES. Kans. Agr. Expt. Sta. Tech. Bull. 38, 65 pp., illus. 1934.

BLAIR, E. C.

LESPEDEZA IN NORTH CAROLINA. N. C. Agr. Col. Ext. Circ. 195, 8 pp., illus. 1933.

——— and KIMREY, A. C.

PASTURES IN NORTH CAROLINA. N. C. Agr. Col. Ext. Circ. 202, 12 pp., illus. 1934.

CAMP, P. D.

A STUDY OF RANGE CATTLE MANAGEMENT IN ALACHUA COUNTY, FLORIDA. Fla. Agr. Expt. Sta. Bull. 248, 28 pp., illus. 1932.

CARRIER, LYMAN, and OAKLEY, R. A.

THE MANAGEMENT OF BLUE-GRASS PASTURES. Va. Agr. Expt. Sta. Bull. 204, 18 pp., illus. 1914.

DUSTMAN, R. B., and VAN LANDINGHAM, A. H.

THE CHEMICAL COMPOSITION OF CONSECUTIVE CUTTINGS OF ANDROPOGON VIRGINICUS AND DANTHENIA SPICATA. Jour. Amer. Soc. Agron. 22(8): 719-724, illus. 1930.

GILBERT, L. D.

TIMBER GROWING AND LIVE STOCK PRODUCTION. South Forestry Cong. Proc. 9: 86-88. 1927.

GREENE, S. W.

PERMANENT PASTURES FOR PINE LANDS. Lumber Trade Jour. 95(2): 24. 1929.

HENSEL, R. L.

EFFECT OF BURNING ON VEGETATION IN KANSAS PASTURES. Jour. Agr. Research 23: 631-643, illus. 1923.

RECENT STUDIES ON THE EFFECT OF BURNING ON GRASSLAND VEGETATION. Ecology 4: 183-188, illus. 1923.

ROLES, P. H.

RHODES GRASS. Fla. Agr. Expt. Sta. Bull. 138: 183-190, illus. 1917.

SCOTT, J. M.

BAHIA GRASS. Fla. Agr. Expt. Sta. Press Bull. 320, 2 pp. 1920.

PERMANENT PASTURES FOR FLORIDA. Fla. Dept. Agr. Bull. (n. s.) 27, 46 pp., illus. 1929.

TABOR, P., and ALEXANDER, E. D.

PASTURES FOR GEORGIA. Ga. State Col. Agr. Bull. 389, v. 19, 32 pp., illus. 1930.

THOMPSON, J. B.

CARE AND MAINTENANCE OF THE BERMUDA GRASS PASTURE. Fla. Agr. Expt. Sta. Press Bull. 312, 2 pp. 1919.

NAPIER AND MERKER GRASSES—TWO NEW FORAGE CROPS FOR FLORIDA. Fla. Agr. Expt. Sta. Bull. 153: 237-249, illus. 1919.

SOME FLORIDA GRASSES. Fla. Univ. Agr. Ext. Bull. 28, 44 pp., illus. 1921.

TRACY, S. M.

FORAGE FOR THE COTTON BELT. U. S. Dept. Agr. Farmers Bull. 1125, 63 pp., illus. 1920.

ANIMALS

BECKER, R. B.; NEAL, W. M.; and SHEALY, A. L.

1. SALT SICK: ITS CAUSE AND PREVENTION. 2. MINERAL SUPPLEMENTS FOR CATTLE. Fla. Agr. Expt. Sta. Bull. 231, 23 pp., illus. 1931.

BLACK, W. H.

FEEDING BEEF CATTLE IN FLORIDA. Fla. Univ. Agr. Expt. Bull. 26, 19 pp., illus. 1920.

DVORACHEK, H. E., and SEMPLE, A. T.

BEEF PRODUCING QUALITIES OF PUREBRED ABERDEEN-ANGUS CATTLE COMPARED WITH ARKANSAS NATIVE CATTLE. Ark. Agr. Expt. Sta. Bull. 247, 19 pp., illus. 1931.

KNAPP, BRADFORD, JR., and SHEALY, A. L.

BEEF CATTLE IMPROVEMENT IN FLORIDA. I. IMPROVEMENT OF BEEF HERDS THROUGH BREEDING. II. A METHOD OF GRADING RANGE BREEDING COWS. Fla. Agr. Expt. Sta. Bull. 281, 22 pp., illus. 1935.

LEFFELMAN, L. J.

FOREST AND GAME MANAGEMENT IN SOUTH CAROLINA WITH SPECIAL REFERENCE TO GAME BIRDS. Jour. Forestry 31: 658-663. 1933.

LEOPOLD, ALDO.

REPORT ON A GAME SURVEY OF MISSISSIPPI. (Submitted to the Game Restoration Committee, Sporting Arms and Ammunition Manufacturers Institute.) 215 pp., illus. 1929. [Typewritten.]

LEVECK, H. H., and BUCHANAN, D. S.

SHEEP PRODUCTION IN MISSISSIPPI. Miss. Agr. Expt. Sta. Bull. 260, 36 pp., illus. 1928.

MOHLER, J. R.

IMPROVING CATTLE IN AREAS FREED OF TICKS. U. S. Dept. Agr. Leaflet 51, 8 pp., illus. 1929. (Revised 1933.)

STODDARD, H. L.

THE BOBWHITE QUAIL: ITS HABITS, PRESERVATION, AND INCREASE. 559 pp., illus. New York, Charles Scribner's Sons. 1931.